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GLOSSOSIPHONIA HETEROCLITA L.: A HIRUDINID PARASITIZING GASTROPOD MOLLUSKS
[Glossosiphonia heteroclita L.: Hirudinée prédatrice de mollusques gastéropodes]

by

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In November 1934, while dissecting specimens of Limnaea peregra Müller collected in the Dives marshes close to Troarn (Calvados), I noted the frequent presence of a small hirudinid in the pallial cavity of this mollusk. This leech, a member of the Glossosiphonidae family, Glossosiphonia heteroclita L. [1], is characterized by its small size, its transparent integuments and the arrangement of its three pairs of eyes. Like all the members of this family, it feeds on soft-bodied animals and worms; according to Moquin-Tandon [2], it attacks Physes and Planorbids. I therefore attempted to determine the exact mode of life of this hirudinid.

All the Glossosiphonias used in my research were collected from Limnaea peregra Müller, in whom they occur plentifully. Thus from 420 Limnaeas I obtained 173 leeches ranging in size from 3 to 11 mm; these measurements were made with the animal at rest and not contracted.

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I first attempted to determine the exact location of G. heteroclita in the mollusk. For this purpose, I removed a number of individuals from a group of Limnaea I suspected of containing parasites and fixed some of them in formaldehyde and some in alcohol at 95°C. Dissection revealed that the leeches were always located in the pallial cavity of the mollusk, although their exact site of attachment varied. Despite numerous tests, I was unable to determine the route by which G. heteroclita had entered the host. It probably does so by the pneumostome, but I was unable to find any information on this. However, it is very easy to infest Limnaeas experimentally: they need only be placed in the presence of a number of Glossosiphonias which have had no food for several days.

It remained to be determined whether the leeches entered the pallial cavity of the Limnaeas for shelter or for food.

Experiment I. Assuming that G. heteroclita was sucking the blood of the Limnaeas, I injected carmine in powder form into several L. peregra experimentally infested with G. heteroclita, expecting to find a few grains of this substance in the digestive tube of the leeches.

A few days after injection, I dissected the mollusks and removed the leeches. I was unable to observe carmine in the digestive tube of any of the animals. This experiment, which was repeated several times, always yielded negative results, even though the Limnaeas had been saturated with carmine.

Continuing along the same lines, I replaced the Limnaeas, whose blood is colorless, with mollusks with colored blood; for this purpose I used Planorbis corneus L. and Pl. umbilicatus Müller, whose red blood was especially well suited to the tests being performed.

Experiment II. Twenty leeches were placed in the presence of ten

Planorbids. Three days later, all the leeches were unattached in the test pan, but the caecums of the digestive tubes of three of them were red, sharply outlined under the integuments. This fact clearly indicated that they had sucked the blood of the mollusks. A few days later, by breaking the shell of a Planorbid I was able to find one Glossosiphonia in place, and here again the caecums were red in color.

Experiment III. Ten Planorbids, seven Limnaeas and 35 G. heteroclita were placed in a pan; four days later, the following observations were made:

Two Limnaeas were untouched; one contained one leech, and three others contained two each; the remaining one contained five Glossosiphonia in its pallial cavity.

Three of the Planorbids each contained one leech; the digestive caecums of two of these three leeches were red. In one Planorbid 13 mm in diameter I found two leeches 4 mm and 5 mm long, whose digestive tubes were also red.

Finally, I noted the presence of 18 free Glossosiphonias, eight of whom had either partially or completely colored caecums, indicating that they had parasitized the Planorbids.

These experiments performed with L. peregra and the Planorbids (Planorbis corneus and P. umbilicatus) showed that G. heteroclita does feed on the blood of these mollusks, but that it does not kill them. I felt it would be valuable to determine whether the same were true of other mollusks.

Experiment IV. Ten Leptolimnaea glabra Müller ranging in size from 6 mm to 10 mm were placed in the presence of ten Glossosiphonias. The next day six leeches remained unattached, and the four others, which were small (3 mm to 5 mm), were inside the pallial cavity of the mollusks, one of them containing two.

Experiment V. Six Physa fontinalis L. and six Bythinia tentaculata L. were placed in a pan with 12 leeches; six days later, the leeches were still unattached and did not seem to have attacked the mollusks. However, the next day one of the Physes had been broken and the caecums of the digestive tubes of six Glossosiphonias were stained brown, and one of the leeches was still half buried in the cadaver of the mollusk.

Experiment VI. Seven Ancylus sp. were placed in the presence of seven leeches. The next day, the digestive tubes of three of the leeches showed a brown coloration; of these, one was still attached to the body of an Ancylid whose shell had been fractured, revealing part of the internal organs. I removed the contents of the digestive tube of one of these Glossosiphonias, and after staining the material, I observed cell components comparable to those obtained in a preparation from the liver of one of these mollusks.

All the preceding experiments used Gastropods. Now, Brumpt (Zoologie descriptive [Descriptive zoology], Vol. I, Chapter 20, "Hirudinids," p. 4) states on the subject of the Clepsines, especially Glossosiphonia complanata L.: "The Clepsines feed almost exclusively on small bivalves of the genuses Cyclas and Pisidium." The next step was therefore to determine whether the same was true of G. heteroclita.

Experiment VII. Ten Glossosiphonias were placed in the presence of eight Sphaerium corneum L. The leeches remained completely indifferent to these bivalves, even though the internal organs were exposed by partial crushing of the shell.

These experimental results revealed a few facts on the mode of life of G. heteroclita. Apparently Gastropods are the only prey of this leech; Experiment VII shows their indifference to the bivalve Sphaerium corneum, even

though the leeches had been without food for about two weeks. Among the Gastropods, it is strange to note (Experiment V) that the leeches do not attack Bythinids. I should also mention that I have never observed G. heteroclita to be present in Limnaea stagnalis L. in nature, and that infection tests have yielded no results in this case.

It may be concluded from these experiments that G. heteroclita feeds on certain species of mollusks (Limnaea peregra, Planorbis corneus and Pl. umbilicatus). It enters the pallial cavity for this purpose, but the injuries which have been found did not result in the death of the animal. During my research, I frequently observed four leeches present in a single Limnaea, and during my experiments, I found that some mollusks containing up to five parasites showed no symptoms of ill effects whatever. Small Lepto-limnaea were found to be infested during Experiment IV; these were sacrificed in apparently healthy condition, without any behavioral indications distinguishing them from the unharmed individuals.

However, Experiments V and VI showed that in some cases, Glossosiphonia does not merely suck the blood of mollusks, but devours them completely. This is the case with Physa and Ancylus when the shell is not intact.

It should further be noted that most of the Glossosiphonias which had sucked the blood of the Planorbids were found unattached in the test pan; only six out of 17 were observed in place in the pallial cavity of the mollusks. If these results are compared with those obtained in the experiments on Limnaeas, it appears that these leeches do not remain in their host when it is a Planorbid. I am not aware of the reason for this behavior, but it may explain why G. heteroclita is found in the pallial cavity of Limnaeas in nature, while Planorbids, which have the same structure, do not contain any.

To summarize, G. heteroclita seems to be a hirudinid which parasitizes pulmonated Gastropod mollusks by sucking their blood.

The genuses currently included in the Glossosiphonidae family formerly were all known by the general term Clepsines. Reference to various descriptions of the mode of life of these leeches shows that almost all investigators agree that these are carnivorous species. Thus Claus (Traité de Zoologie [Treatise on Zoology], Vol. II, pp. 564 and 1884), using the terms given by G. von Hayek (Handbuch der Zoologie [Zoology Handbook], Vol. I, pp. 352 and 1877), states in this regard: "Some, such as the horse leech, Aulastomum gulo, are truly carnivorous and feed on mollusks and Lumbricids, or, like the Clepsines, attack Gastropods." This opinion is shared by Brehm, Coupin, and Brumpt, but these investigators give the exact species: these are the bioculate Clepsine (Clepsine bioculata, or Helobdella stagnalis L.) and Glossosiphonia complanata L., whose large size explains its behavior. More recently, Brocher (L'aquarium de chambre [Room aquariums], 1913) has given a median opinion: "They (the Clepsines) feed primarily on Gastropod mollusks, sucking their blood or even eating the entire animal when they have had no food for some time, leaving only a completely empty shell." Oddly, it was the earliest investigator who gave the most accurate description of the mode of life of the Clepsines. In his Monograph on the Family of the Hirudinidae (1827), Moquin-Tandon states in this regard: "With their small tubular proboscis the Clepsines attack Physes, Planorbids and Limnaeas. They gorge themselves on the blood of these animals, and, since the muscles and integuments of their bodies are almost transparent, in cases where the animal has sucked red blood, the windings and festoons of the alimentary canal can be seen through the skin."

This description is in complete accord with my findings.

Bibliography

1. "Hirudinids," Die Susswasserfauna Deutschlands, No. 13, p. 75.

2. Moquin-Tandon, Monographie de la famille des Hirudinées [Monograph on the family of the Hirudinidae], 1827, p. 106.